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The Impact of Farm Credit in Pakistan

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The Agricultural Development Bank of Pakistan (ADBP), which provides most formal loans in Pakistan's rural areas, lends to largeholders far more than to smallholders, although the impact of credit is greater for the smallholders. Targeting credit to smallholders would make ADBP's credit scheme more cost-effective. To reach poor farmers and farmers without assets—in other words, to reduce poverty—stringent collateral requirements should be relaxed and outreach should be broadened.

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Summary findings

Both formal and informal loans matter in agriculture. But formal lenders provide much more in production lending than do informal lenders, often at a higher cost than what they can recover. The Agricultural Development Bank of Pakistan (ADBP), for example, providing about 90 percent of formal loans in rural areas, incurs high costs on loan defaults. Like other governments, the Government of Pakistan subsidized the formal scheme on the grounds that lending to agriculture is a high-risk activity because of covariate risk.

Because farm credit schemes are subsidized, policymakers must know if these schemes are worth supporting. Using recent data from a large household survey from rural Pakistan, Khandker and Faruqee estimate the cost-effectiveness of the ADBP loans. To estimate credit's impact, they use a two-stage method, which takes into account the endogeneity of borrowing.

Clearly, formal lenders are biased toward larger farmers with collateral. Large landowners, who tend to represent only 4 percent of rural households, get 42 percent of formal loans. Landless and subsistence farmers, who represent more than 69 percent of rural households, receive only 23 percent of formal loans.

ADBP loans improve household welfare but, although large farmers receive most of the ADBP finance, the impact of credit is greater for small farmers than for large farmers. Large landowners use formal loans unproductively.

Because the ADBP scheme is subsidized, it is not cost-effective for delivering rural credit. It would be more cost effective if small farmers were better targeted instead.

This paper—a product of Rural Development, Development Research Group—is part of a larger effort in the group to understand the cost-effectiveness of alternative credit delivery systems and their impact on rural poverty. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Pauline Kokila, room MC3-510, telephone 202-473-3716, fax 202-522-1151, email address pkokila@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at skhandker@worldbank.org or rfaruqee@worldbank.org.August 2001. (32 pages)

THE IMPACT OF FARM CREDIT IN PAKISTAN

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THE IMPACT OF FARM CREDIT IN PAKISTAN

1. Introduction

Credit plays an important role in development. It capitalizes farmers and entrepreneurs to undertake new investments or adopt new technologies. It helps smooth consumption by providing working capital and reduces poverty in the process. Both formal and informal lenders are active in rural credit market (Adams and Fitchett 1992; Aleem 1990; Ghate 1992; Hussain and Demaine 1992; Udry 1990). Collateral-free lending, proximity, timely delivery, and flexibility in loan transactions are some of the attractive features of informal credit.[1] Unlike formal finance, informal finance may not be as conducive to development because: (i) it is expensive,[2] (ii) it is short-term and largely used for consumption, and (iii) it is not large enough to spur investment and growth.

Notwithstanding the limitations of informal finance, many governments have attempted in the past to develop alternative financial institutions to provide credit to farmers and other rural producers. Many such attempts have failed not only in delivering credit to target households but also in promoting a viable credit delivery system. High covariate risk of agricultural production (Binswanger and Rosenzweig 1986), the asymmetric information and lack of enforcement of loan contracts (Hoff and Stiglitz 1990)[3], government imprudent interference in credit markets, and rent-seeking as a result of credit rationing (Braverman and Guasch 1989) are some of the factors alleged for the poor performance of the government-directed credit schemes in many countries.

With the dismal picture of state-owned rural finance organizations, micro-finance non-governmental institutions are growing to meet the credit needs of small producers in many countries. Reports indicate that they now meet the credit demand of 8-10 million people in

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[1] Although the nominal rate of interest is lower for a formal loan than for an informal loan, the transaction costs of borrowing are higher for formal loans than for informal loans. However, unlike formal loans, informal loans have small transaction costs, which reflect the opportunity cost of funding and are independent of collateral, duration, and size of loans. Informal lenders also perform an important role by facilitating the marketing of products or purchasing inputs, such as fertilizer. The informal loans are often in kind and purpose-specific, and, hence, serve some clientele need better.

[2] Some studies, however, questioned the excessive interest rates of informal lenders (e.g., Hussain and Demaine 1992).

[3] To reduce the moral hazard problem and associated transaction cost of lending, financial institutions often ask for physical collateral. Collateral restrictions exclude the poor who do not have assets, such as land, to offer as collateral but are otherwise good credit risk.

Africa, Asia, and Latin America.[4] Many of these organizations are subsidized not for high loan default costs but for higher transaction costs associated with group-based lending and other social intermediation costs (Khandker 1998). If agricultural credit schemes are to be supported, policymakers must know how much they are subsidized, who receives this subsidy, and whether it helps the borrowers.

Assessing cost-effectiveness of a program means evaluating both its costs and benefits. Assessing the costs of lending involves the imputed market cost of subsidy these schemes receive from governments and donors. Assessing benefits is often problematic because funds are fungible and because it is not clear if measured credit effect reflects the borrowing constraint or the unobservable characteristics of a borrower. The presence of bias caused by self-selection of borrowers into programs may bias assessment of benefits by as large as 100% of actual impacts.[5] Nonetheless, there are a number of studies that have successfully estimated program benefits (Binswanger and Khandker 1995; Carter 1988; Carter and Weibe 1990; Feder and others 1990; Pitt and Khandker 1996). Binswanger and Khandker (1995) estimate the impact of formal credit using district-level data from India and find that formal credit increases rural income and productivity and that rural benefits exceed the cost of the formal system by at least 13 percent. Feder and others (1990) estimate a switching regression model for households in China, and distinguish between households that are credit-constrained and those that are not.

Pitt and Khandker (1998) examine the impact of credit from the Grameen Bank and other targeted credit programs in Bangladesh on a variety of individual and household outcomes, including enrollment, labor supply, asset holding, fertility and contraceptive use. They find credit to be a significant determinant of many household outcomes, and that program credit has a significant effect on the well-being of poor households in Bangladesh. Khandker (1998) observes that micro-credit programs are as cost-effective as other programs, such as the Food for Work, in benefiting the poor.

The objective of this paper is to analyze the role of the agricultural development Bank of Pakistan (ADBP) in rural areas and assess its cost-effectiveness in delivering farm credit. The paper's contribution lies in adding to the existing literature on the cost-effectiveness of a government-supported farm credit program, which has not been managed well over many years. The data used in this paper's analysis is drawn from the rural financial market studies (RFMS)

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[4] For a discussion of a broad range of programs, see Otero and Rhyne (1994), Christen, Rhyne and Vogel (1994), Brugger and Rajpatirana (1995) and Hulme and Mosley (1996).

[5] See McKernan (1996).

from Pakistan. Results suggest that the effect of ADBP finance is substantial, and that the impact is higher for small holders than for medium and large holders in agriculture. Given the distribution of loans and loan recovery rates, the ADBP is not a cost-effective scheme. The scheme can be made cost-effective by supporting small holders more than medium and large holders, improving both loan recovery and administrative efficiency, and making operations liable to a lending portfolio.[6]

The paper is organized as follows. Section two describes the rural credit market of Pakistan. A number of studies including recent data show that market share of institutional credit is low despite government intervention since 1960. Also formal credit has failed to reach the borrowers who may have more productive use of credit. Section three explains the econometric models used to asses the credit impacts on different household outcomes. Section four discusses the regression results. Based on the two-stage estimation techniques, formal credit has been found to have significant positive impacts on most household outcomes considered in this paper. Section five shows how much costs are involved for ADBP in providing credit. Section six presents the cost-benefit analysis of the ADBP. The concluding section summarizes the findings and discusses policy options.

2. The role of Agricultural Development Bank of Pakistan (ADBP)

Pakistan's rural credit markets, as in other developing countries, are characterized by the co-existence of formal, semi-formal, and informal lenders. Agricultural Development Bank of Pakistan (ADBP) dominates the formal institutions. Informal lenders include a wide variety of lenders in the villages and surrounding areas, including friends and relatives. Semi-formal institutions are NGOs and other micro-finance institutions. Both formal and semi-formal financial institutions cover a very small share of rural credit markets (Aleem 1990; Ghate 1992).[7] The 1985 rural credit survey indicates that only 10 percent of rural borrowing households borrowed from formal sources and a very negligible percentage (less than 1 percent) borrowed from semi-formal sources (Qureshi, Nabi, and Faruqee 1996). As the size of an average formal loan is bigger than that of an informal loan, formal credit accounted for 32 percent of total

[6] By providing more loans to smallholders may increase transaction costs but it would also reduce high loan default costs for making more loans to large holders because the loan recovery rates are higher for smallholders than for large holders in agriculture.

[7] For general reference see Adams and Fitchett (1992), Hoff and Stiglitz (1990), World Bank (1993).

volume of loans outstanding.[8] More recent survey data of the Rural Financial Market Studies (RFMS), which was administered in 1995 all over Pakistan, shows even a smaller share of institutional credit.[9] Of the 4,380 rural households surveyed, about 59 percent (i.e., 2,581 households) reported having taken some kind of loan, of which only 7 percent (i.e., 180 households) took loans from institutional sources (Table 1). Because of larger loan size, formal credit accounted for 22 percent of total amount of loans (table 2).

The ADBP has been the dominant source of institutional credit, while "friends and relatives" are the largest source of non-institutional credit. The ADBP accounted for 55 percent of formal loans in 1985 followed by commercial banks (29 percent) and cooperatives (15 percent). It provided 86 percent of total loans followed by government (5 percent), NGOs (4 percent), commercial banks (3 percent), and cooperatives (2 percent) in 1995 (Table 2). Friends and relatives, who do not charge any interest, provided 67 percent of informal loans in 1985 compared to 57 percent in 1995. The share of informal lenders, who charge an interest, has increased from 33 percent in 1985 to 45 percent in 1995 (table 2). Out of 43 percent interest-bearing informal loans in 1995, landlords accounted for 13 percent followed by shopkeepers (7 percent), *arthi* and input dealers (each by 6 percent), and a host of others suppliers of informal loans (11 percent together) (Table 2).

Formal credit explains one-third of rural credit and accounts for not more than 5 percent of agricultural GDP (Qureshi, Nabi, and Faruqee 1996).[10] Even this small share is increasingly unsustainable because of subsidy dependence of the ADBP. The ADBP's subsidy accounts for 30 percent of its loan outstanding with a loan default cost as much as 60 percent. Commercial banks are reluctant to lend in rural areas; while rural deposit accounts for more than 30 percent of its total deposit, commercial banks do not have more than 5 percent of their loan portfolio in rural areas. The situation has not improved since 1985. The market-based credit transactions include the transactions of the commercial banks, NGOs, moneylenders, input and output dealers, and other informal lenders. These lenders together do not account for more than 50

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[8] Later surveys indicated a similar coverage of the institutional loans. According to 1990 agriculture census, formal credit accounted for 38 percent of all outstanding loans of rural households. The International Food Policy Research Institute (IFPRI) study conducted in 1990 shows that institutional credit accounted for 32 percent of rural credit in Pakistan (von Braun, Malik, and Zeller 1993).

[9] For discussion of the RFMS, see the appendix.

[10] The rural production in Pakistan is largely self-financed. The IFPRI household study showed that credit met only 17 percent of the production expenditures of rural households (von Braun, Malik, and Zeller 1993). Since formal credit accounted for only 32 percent of rural credit, it accounted for only 5 percent of the production expenditure.

percent of the loan transactions taking place in rural Pakistan. More importantly, about 70 percent of this market source of credit comes from highly segmented informal credit markets, where transactions are often a result of personal contacts.

The dominance of informal finance with a lack of market-based rural finance has negative implications for rural growth and welfare. To illustrate this point, consider the purpose and duration of informal loans vis-à-vis formal loans. Data shows that formal credit is meant for production and investment, while informal credit is for consumption. In 1985, 94 percent of institutional credit was for agricultural production and investment, while only 53 percent of non-institutional credit were for production. Moreover, informal loan is largely short-term (90 percent), while formal loan is medium- and long-term (68 percent). According to the 1995 survey, only 5 percent of formal loan, compared with 56 percent of informal loan, went to meet consumption needs (Table 3). Informal loans are mostly (93 percent) for a duration of less than a year, while formal loans are largely (65 percent) for more than a year. Formal credit used for production is used primarily for agriculture production (88 percent) followed by rural non-farm activities (7 percent). Of informal loans used for production, agriculture accounted for 27 percent and non-agriculture accounted for 18 percent. In an economy dependent too much on informal finance, which is largely used for consumption smoothing, rural growth, which requires long-term productive investment, is likely to be hampered.

Despite its limited role, past studies have clearly highlighted the importance of institutional credit in Pakistan (Zuberi 1989; Malik and others 1991). Zuberi (1989) finds that 70 percent of total institutional credit is used for the purchase of seed and fertilizer, and concludes that most of the increases in agricultural output can be explained by changes in the amount of seed and fertilizer expenditure. Malik and others (1991) attempt to provide evidence for the role of institutional credit in agricultural production. They use a two-stage structure where the probability of taking an institutional loan is predicted in the first stage and the predicted value is used in the second stage to estimate the impact of fertilizer use per acre.[11] Like Zuberi's study (1989), their results show that institutional credit is an important determinant of fertilizer and seed expenditure. The study of von Braun, Malik and Zeller (1993) shows that farmers having access to credit have 37 percent higher input expenditures than those who do not have access to credit.

[11] Malik and others (1991) used variables such as household attitude toward interest-bearing loan and village credit measuring the total institutional credit obtained by the households in the village other than the household in the observation. The latter instrument measures the impact of infrastructure and other village variables on the demand for credit.

The impact of credit may vary by the distribution of loans by the wealth of a borrower. In 1985, only 1 percent of the formal credit accrued to the poorest households, as compared to 60 percent accrued to the richest households. In 1995, about 2 percent of formal credit were accrued to the poorest households, compared to 72 percent to the wealthiest households. The poor receive a fair share of informal loans, however. In 1995, almost 17 percent of informal loans (including loans from friends and relatives) was accrued to the poorest households compared to 31 percent to the wealthiest households. For example, as table 4 shows, households with large operational holding (more than 25 acres), who are about 4 percent of landowners, comprises 42 percent of households borrowing exclusively from formal sources. In contrast, households with no operational holding, who constitute 34 percent of the rural households, constitute only 5 percent of borrowers from formal sources, while subsistence farmers, comprising 35 percent of rural households, are only 18 percent of borrowers from formal sources.

The skewed distribution of formal credit must have an impact on agricultural growth and rural poverty in Pakistan. If the impact of formal credit is higher for small holders than for large holders, and large holders receive the lion's share of formal credit, one can hypothesize that the skewed distribution of formal credit has a negative effect on rural growth and welfare. This is indeed a concern, even when some 22 percent of rural borrowing comes from formal sources.

3. Credit impact assessment: An Econometric Framework

What researchers observe is the amount of credit received from a source that is based on both the demand for and the supply of credit. The real difficulty is how to disentangle the demand from the supply. Often household and area characteristics determine the household's demand for credit. But these same characteristics also influence the supply of credit, giving rise to the problem of selection bias of who receives a loan. It is possible that borrowers are more productive not because of the loan, but because they are more entrepreneurial, dedicated, and hard-working. It is also possible that borrowers are productive and, hence, able to repay, not because they have better ability but because they have a better productive environment.

Lenders screen borrowers based on their unobserved traits and environmental characteristics which are not easily observed by researchers. Thus, the allocation of credit is not

random.[12] As funds are fixed, the lenders would like to allocate funds to the best possible borrowers and to the best possible agroclimate area.

A borrower's motivation and willingness to repay are some of the features a lender must consider when lending. Informal lenders, because of their proximity and familiarity, tend to lend to individuals with credit worthiness as well as involvement in productive activities that have high potential. Formal lenders, while they are not part of the community, also use their own subjective evaluation of the credit worthiness of a borrower by often judging by the level of wealth a household possesses and other attributes. To obtain consistent estimates of the impact of credit, we need to sort out the endogeneity of credit received by an individual from any source.

Consider the quasi-reduced form of an welfare equation,

$$(1) \qquad Y_{ijk} = C_{ijk}\delta + X_{ijk}\beta + M_{ijk}\gamma + \xi_{ijk}$$

The left-hand side variable, Y_{ijk}, indicates the outcome of interest such as consumption of household i of village j of district k, C_{ijk} denotes household's receipt of formal credit, M_{ijk} reflects unobserved household characteristics like entrepreneurship and dedication that make the loan amount endogenously determined, X_{ijk} denotes the observed household characteristics like age, education, sex of head of the household and ξ_{ijk} is the error term. If all variables are observable, δ would determine the impact of credit without bias. However, since M_{ijk} is unobservable, if the receipt of credit serves as an indicator of these unobserved variables, this would result in biased estimates of the equation (1).

A common way out of this predicament is to first estimate the determinants of borrowing and then use them to correct for selection bias in the second stage. Consider estimating first the following borrowing equation:

$$(2) \qquad C_{ijk} = X_{ijk}\beta^c + Z_{ijk}\sigma^c + M_{ijk}\gamma^c + \varepsilon ijk$$

The left-hand side variable of (2) denotes borrowing from formal sources, while the right-hand side variables are the same as in the welfare equation, with superscripts differentiating the coefficients. The Z variables are selected in such a way that they do not overlap with the welfare equation, and serve as instrument variables. Omitted variables in both equations–

[12] See Pitt and Khandker (1996) for a discussion of selection biases.

denoted by the M variables–would result in errors that would be correlated in both equations and give rise to an endogeneity bias.

A possible way of resolving the endogeneity of credit is to find out if there is any exogenous eligibility criteria used by a lender in selecting a borrower. Such an eligibility rule is used by Pitt and Khandker (1998) to sort out the endogeneity of credit obtained from a micro-credit program such as Grameen Bank. They use a quasi-experimental survey design as an identification strategy in a setting where eligible and non-eligible households based on landholding were interviewed in both program and control areas. Such an eligibility criteria-based instrumentation is not appropriate for assessing the impacts of formal credit in Pakistan, since the formal credit system ADBP has no exogenous loan eligibility criteria.

Finding convincing instruments, Z_{ijk} variables, therefore, is a critical part of this exercise. According to demand theory, the price can be a good instrument for predicting the demand for a good. The price of formal finance is its interest rate, which hardly varies. Hence, the interest rate cannot be a good predictor of the demand for credit. We propose a set of instruments based on the fact that the loanable fund of the ADBP is fixed and that there is far more demand than the ADBP can meet. Moreover, ADBP disburses much more than what they mobilize and often funds come from the government and donors. In this case, it is not the price of a loan but the availability of the fund that matters most in determining how much a household can borrow from ADBP. Given the available fund, borrowing of a household from ADBP would depend not only on its own characteristics but also characteristics of its competitors. The competitor's characteristics are possible instruments in the borrowing equation. The competitors can be at the village level as well as at the district level where their characteristics would influence a particular household's demand for credit without influencing its outcomes, such as consumption and investment.

Thus, for the allocation of a scarce fixed fund, formal financial institutions such as the ADBP would consider the characteristics of indicators, such as education and landownership of borrowers.[13] Thus, while these measures of a borrower living in a district are important, similar measures for other competing districts are also important in determining the fund allocation in a

[13] The idea is, given a fixed amount of loanable funds, the more credit worthy the household's competitors are, the less likely the household will be to get credit. For example, if lenders look to the amount of landholding in deciding whether to give loans, a household may be less likely to obtain a loan if its competitors are on average holding more land. Even if the village competitors' characteristics may not be good instruments because of "spillover" or "social capital" arguments, including characteristics of other villages in other districts are still valid instruments, as they are unlikely to have any spillover effect. In any case, we will carry out a specification test to justify whether they are valid instruments.

particular district. So, for the district p among N_p districts, we calculate not only the averages of household indicators for district p but also for all households in $(N_p - 1)$ districts excluding district p. For each village we calculate similar averages of household variables. These competitors' indicators are then the instruments for identifying how much a household can obtain from a formal finance institution. The equation (2) can be written as

$$(2') \quad C_{ijk} = X_{ijk}\beta + \overline{X}_{jk}\sigma + \overline{X}_{k-j}\rho + \overline{X}_{k}\delta + \overline{X}_{p-k}\lambda + M_{ijk}\gamma + \varepsilon_{ijk}$$

where additional subscripts are introduced to indicate village (j) and district (k). For example, C_{ijk} represents credit of household i of village j of district k. In addition, the Z variable has been replaced by $\overline{X}$ variables, which are averages of household variable X computed at the following levels: $\overline{X}_{jk}$ at village level for village j, $\overline{X}_{k-j}$ at district level for district k excluding village j, $\overline{X}_{k}$ at district level for district k, and $\overline{X}_{p-k}$ for all districts of Pakistan excluding the district k.

Borrowing reflects three possible outcomes: (i) no borrowing for lack of access to ADBP, (ii) no borrowing when households decide not to borrow, even if the ADBP is there, (iii) a positive amount of borrowing, given that the household decides to borrow and the ADBP branch is available. The coefficient of credit measures the impact of one more rupee of borrowing from a formal source, such as ADBP, on household outcomes such as consumption, allowing the household to adjust its borrowing "portfolio" and all other behaviors, in response.

4. Estimates of credit impact

In order to distinguish the results based on two-stage method just discussed with those of the case where credit from ADB is taken as given, we present both sets of results for outcomes of particular interest. Data on borrowing from ADBP and other formal sources is given for each household over the last five years since the data survey period. The cumulative amount of borrowing from formal sources over the five year period is the policy variable. A tobit model is used to estimate the demand for borrowing from formal sources.[14] This would reflect the long-term decision to borrow.

[14] For many households the observed amount of credit from either source may be zero. This is why the observed credit is a truncated variable, and a Tobit specification is appropriate for the cumulative borrowing equation. Where the dependent variable is binary such as 1 or zero, a probit or logit rather than a linear probability model is appropriate. However, since we used the predicted value in the

For getting efficient estimates of credit effects, one would form three likelihood functions with each possible credit outcome and estimate a joint log-likelihood function. This introduces complicated estimation problems. Instead, a two-stage procedure is used which yields consistent estimates.

We use household observable characteristics including highest grades completed by a male and a female, the total numbers of adult males and females in the household, sex and age of the household head, and land owned by the household as independent variables. Village characteristics, including the prices of rice, wheat, gram, milk products, beef, fish, vegetables, molasses and sugar, fruits, and maize, are also used to control for village effects in the regression, which may reflect the "distance effect". The cumulative amount of credit taken by the households from formal lenders, or the households' status of borrowing from formal sources over the last five years prior to the survey, are used as a separate explanatory variable in the welfare equation, although it is the dependent variable in the first stage regression.

The first stage tobit regression includes competitors' characteristics as instrumental variables. Table 5 gives summary statistics of those variables excluding the village price variables. Table 6 presents the tobit estimates of the borrowing equation (2'). The significance of the education variables in the first stage tobit regression for formal loans indicates that policies directed towards increasing the flow of information may improve access to formal credit. Note that households with educated members actually take more formal credit. Similarly, households with more land enjoy greater access to formal loans. But the education and landholding of the competitors seem to reduce the amount of borrowing by the households.

We use the logarithmic specification for both the cumulative amount of credit and the other outcome equations of interest. Tables 7 summarizes the effects of formal credit on selected household welfare outcomes. To compare results, we present both the OLS and two-stage. While the two-stage results control for endogeneity of credit, the ordinary least squares (OLS) estimates assume that credit is randomly given. To find out whether the 2SLS (where endogeneity is controlled using the competitors' characteristics as instruments) is more appropriate than the OLS, we carried out the Durbin-Wu-Hausman (DWH) test which basically calculates an F-statistic for the residual term that is predicted from the first stage equation (2′) and then used as an explanatory variable in the second stage equation (1)[15].

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second stage outcome equation, the linear probability model still produces consistent estimates in the second stage outcome equation.

[15] The second stage equation uses both the credit variable and predicted residual as explanatory variables.

The results are reported in table 8. They show that in four out of six outcomes there are systematic differences between the two models. That means, in these cases, the OLS results show that the amount of credit from formal sources cannot be taken as given, and it responds to the same variables that affect the outcomes of interest. Hence, the two-stage estimates are preferred over the OLS estimates.

The two-stage estimates in table 7 reveal that formal credit has a positive impact on household per capita consumption, for example. Thus, a 10 percent increase in borrowing increases consumption by 0.04 percent for formal loans. Formal credit increases crop production expenses of rural households. One major purpose of credit is to support production costs such as hiring labor or purchasing fertilizer and other inputs. A 10 percent increase in borrowing from a formal source increases agricultural production cost by about 1 percent.

The effect of credit on the net value of agricultural production (i.e., gross value of production less variable production cost) is positive and significant. A 10 percent increase in borrowing from a formal source increases agricultural production by almost by 1 percent. Formal credit has also a large and significantly positive impact on household non-land asset. A 10 percent increase in formal borrowing increases household non-land asset by as much as 0.4 percent.

Formal loans increase female labor supply, without any significant effect on male labor supply. The elasticity of the response of female labor supply with respect to formal credit is 0.06, implying that a 10 percent increase in formal lending is associated with about 0.1 percent increase in female labor supply.

Table 9 estimates the marginal returns to borrowing from the ADBP for different outcomes of interest. The returns are estimated based on both the OLS (without correction for endogeneity of farm credit obtained) and 2SLS (with correction for such endogeneity). Results indicate that the marginal return to household per capita consumption for borrowing from the ADBP is 10 percent per year according to the OLS model compared to 6 percent when correction was made. Hence, returns to borrowing from a formal source are overestimated in the case of consumption. This is not the case, however, for all outcomes. For example, while the marginal return to farm net production is 59 percent according to a model that does not correct for endogeneity, it is 69 percent when such a correction is made. That means, estimates can be lower bound if the endogeneity is not corrected, as in the case of net value of farm production and expenses. The highest returns to borrowing is registered for the case of household non-land asset, where the OLS model is more appropriate than the 2SLS model. One 100 Rupee

borrowing seems to generate a return of Rupees 152 worth of household non-land asset. This is perhaps no wonder in a regime with high loan defaults where part of the unpaid loan money finds its way to support borrowers' accumulation of non-land assets.

5. ADBP Cost of lending

How much does it cost to the ADBP to lend to the farming community in Pakistan? The cost of lending by a formal lender such as the Agricultural Development Bank of Pakistan (ADBP) is based on the cost of lending and interest income derived from lending. Of course, lending is one component of the bank business. It also invests and undertakes other businesses. The annual report provides a statement on income and expenditure of a bank's activities. However, an annual report of a bank such as the ADBP does not reflect the true cost and income of its activities. It receives subsidized funds from the government and donors and the annual report does not reflect the opportunity cost of such funds. With appropriate cost of borrowing and other sources of funds, one can then calculate the net profit a bank earns on its capital. In the case of ADBP, we find that it is highly subsidized (PIDE 1998). The subsidized operation of the ADBP is supported by the government and donors. In such a case, a lender's cost is estimated by the net subsidy it receives. Since an overwhelming portion of the formal loans comes from the Agricultural Development Bank of Pakistan (ADBP), the net subsidy of ADBP can be used to represent the costs of formal lenders.

The sources of subsidy of a program such as ADBP are interest-free grants and concessionary funds. The total subsidy is then defined as the difference between the market rate of interest (which is the opportunity cost of the subsidized funds) times the total value of subsidized fund. As table 10 shows, the net subsidy of ADBP increased from 1,685 million rupees in 1991 to 3,312 million rupees in 1995 (Qureshi and others 1999). This increment was due to the increase of borrowing funds and equity, without any significant increase in the rate of interest. The average subsidy was 4.7 percent of the loans outstanding in 1991 and 7.5 percent in 1995.[16] Thus, unlike informal lending, it is not cost-effective to lend by a formal lender such as the ADBP.

[16] The subsidy of ADBP is not too much when compared to that of other successful financial institutions around the world. For example, Grameen Bank of Bangladesh, which is a role model for micro-credit programs in the World, enjoyed a subsidy rate of 5.6 percent in 1994 (Khandker 1998). But unlike Grameen Bank, the loans of ADBP are received largely by large landholders, who should not receive subsidized credit.

The nominal interest rate of ADBP for these loans rose very little from 1991 to 1995– from 12.5 percent to 13.5percent. The rate of inflation during this period changed from 9.6 percent to 10.4 percent, although it went up to 13.9 percent in 1993. The data clearly shows that the real rate of interest on an ADBP loan was negative for most of the time during the study period. So one way of reducing the subsidy dependence of ADBP is to increase the nominal interest rate. To know how much the nominal rate of interest should be increased to eliminate subsidy, we can use the subsidy dependence index (SDI) measure (Yaron 1992). The SDI is expressed by the net subsidy (total subsidy less accounting profit) as a percentage of interest income received from on-lending (which is in turn defined as the average loan outstanding times the nominal interest rate). SDI measures the percentage increase in the average on-lending interest rate required to eliminate all subsidies in a given year while keeping the return on equity equal to the non-concession borrowing cost. Between 1991 and 1995, the subsidy dependence index increased from .38 to .56. That means, in order to reduce subsidy, the ADBP had to increase the on-lending rate by 38 percent in 1991 and 56 percent in 1995. Using the nominal rate for those years, it means, the nominal rate should have increased from 12.5 percent to 17.2 percent in 1991 and from 13.5 percent to 21 percent in 1995.

Another way of reducing subsidy dependence is to improve the loan recovery rate. The loan recovery has been a major concern for all government-run credit institutions in many countries. Pakistan is not an exception. The loan recovery rate of ADBP was 59 percent in 1991 for all past loans and declined further to 45 percent in 1996 (table 11). The loan default cost was as much as 60 percent for ADBP. Most interestingly, as we found earlier, the bulk of the ADBP loans are received by large landowners, who do not need subsidized loans and are able to repay the loan. Yet political factors played a heavy hand in the loan recovery position of the state-controlled ADBP.

A final way of reducing subsidy dependence of the ADBP is to make it more dependent on its own resources for lending and less on government and donors. The bank must mobilize savings to support its lending. This savings-based lending practice would make it more accountable for its loan disbursement, repayment and the cost of operation. Over the years of 1991 to 1996, the ADBP's savings and deposits accounted for only 23 percent of its loan disbursements, only 13 percent in 1994 and 45 percent in 1991 (Figure 1). The self-sustainability of a bank must come from its increasing reliance on its own-managed resources.

6. Cost-effectiveness of the ADBP

We have discovered that the ADBP is not a cost-effective delivery system, since it is dependent on subsidy. Despite the high loan default costs and subsidy dependence, it is important to find out whether it is cost-effective socially to deliver targeted credit through the ADBP. Since the delivery of farm credit embodies government policies, it is worth exploring whether it is cost-effective to deliver through the ADBP. Alternatively, as the ADBP loan is highly politicized and loans are not repaid back (Qureshi, Nabi and Faruqee 1996), the question worth exploring is who are the beneficiaries of its subsidized operation, and whether the society benefits from such operation.

We measure the cost-effectiveness of the ADBP by the cost-benefit ratio. Benefits are measured by the impacts of credit on household consumption, where consumption measures the extent of poverty.[17] We have taken consumption as a measure of rural welfare, because of wide spread rural poverty in Pakistan. We have two sets of benefits, one based on average benefits accrued to an average household borrower, and the other is based on benefits accrued to different groups of households calculated using the consumption effects of credit estimated for different groups of households based on operational holdings. Like earlier impact estimates done based on the entire sample of households, two-stage regressions were done for three categories of households based on operational holding status: small holders (operational holding up to 12.5 acres), medium holders (operational holding between 12 to 25) and large holders (operational holding more than 25 acres).[18] The revised benefit estimates indicate that benefits are substantial and statistically significant only for small farmers and not other types of households.

The question to address is whether the ADBP loan is socially cost-effective. As indicated earlier, the program-level cost is measured by the net subsidy of a financial institution such as the ADBP. In 1995 the ADBP had a net subsidy of 3.312 million rupees and loans outstanding of 44.160 million rupees. The subsidy is the net cost to the society for supporting the ADBP. To determine the social benefits from the ADBP operation, we first calculate the

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[17] The impact of credit on consumption is taken as a measure of benefit for calculating cost-benefit ratios. Credit is used for production and consumption. The loan used for consumption increases consumption directly by helping consume more and indirectly by increasing labor productivity through sustaining the consumption required for maintaining physical strength of a person. Credit used for production increases income and net worth which in turn help increase the consumption. Hence, the consumption impacts measure the appropriate benefits of credit, which is a short-term welfare indicator.

[18] Thus, small holders include landless, subsistence, and small farmers together, who represent 57 percent of rural households but borrowed about 44 percent of formal credit (see table 4).

average distribution of the loan outstanding (44,160 million rupees) among different landholding groups. Assuming that the social distribution of ADBP loans is the same distribution as witnessed from the weighted distribution of loans of our studied sample, we get the actual amount borrowed by each group. This amount, when multiplied by the marginal return to consumption, gives us an average amount of benefit for different categories of borrowers of ADBP. [19] Aggregating benefits across groups, we get a program-level benefit of 1,640 million rupees, leading to a cost-benefit ratio of 1.347 (=3,312/2,458) (table 12). That means, the social cost of ADBP exceeded the accrued social benefit by as much as 35 percent in 1995. This is very similar to the scenario where we used the aggregate welfare impact of the ADBP lending. So the ADBP lending is not socially cost-effective.[20]

Since the social benefit is positive only for small producers, the question is whether ADBP lending can be cost-effective if all of it were disbursed only to the real beneficiaries, meaning small holders in agriculture. The re-calculation of the social benefits and cost-benefit ratio for the ADBP loans shows that benefits now exceed cost by 73 percent or the cost-benefit ratio is 0.58. Therefore, even if the ADBP is subsidized, a better targeting of its operation could make the ADBP operation worth supporting by the society. Of course, it does not mean that the ADBP must enjoy subsidy. It means that if subsidy were inevitable for running a highly targeted scheme in rural areas, the generated benefits should be large enough so that the society finds it worth supporting. It follows that the ADBP must be redesigned to reach the poor households and small producers. If it cannot improve outreach, then its current subsidy dependence cannot be justified, as its loans are largely benefiting the medium and large landlords, who do not qualify for receiving subsidized credit.

7. Conclusions with policy implications

The purpose of this study was to provide econometric evidence on the impact of farm credit on household welfare and the role of the state-owned agricultural development bank in Pakistan. Like past studies, we find statistically significant effects of institutional credit not only

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[19] Using marginal rather than average returns would underestimate the benefits, if average returns are higher than marginal returns. This is a case of diminishing returns.

[20] Note that this is calculated using the estimates of marginal returns. Ideally one should use the average returns, which is higher, under the assumption of diminishing returns, than marginal returns. In this case, the calculated benefits are perhaps an under-estimate. If average returns are higher than marginal returns, it is possible that the ADBP may be cost-effective. Nonetheless, with the same type of analysis, the ADBP seems less cost-effective than the Grameen Bank of Bangladesh, which is highly successful in reaching the poor households, especially women.

on the determinants of agricultural output, but also on household consumption and other household welfare indicators. Like earlier studies, we find evidence of poor access of small landowners to formal credit. Clearly, formal lenders are biased towards larger farmers who can demonstrate collateral, and as a result the smaller and tenant farmers are left out. In Pakistan, large landowners, who constitute only 4 percent of rural households, account for 42 percent of formal finance, while subsistence and landless households, who constitute more than 69 percent of rural households, receive only 23 percent of formal loans.

Formal loans are taken mostly for production purpose. Data shows that while only 5 percent of formal loans financed consumption, an overwhelming 95 percent went on to support production (88 percent to farm and 7 percent to non-farm production). In contrast, while 56 percent of informal loans meant for consumption, 44 percent went to support production.

These production loans are used for income generation, which would then support higher consumption. Thus, the effect of loans on consumption is indirect---loans support production growth and higher income growth support higher consumption. If household consumption is taken as a measure of household welfare, the estimated marginal impact of formal loans on consumption is substantial. An additional 100 rupees of loan from a formal source such as ADB can increase as much as 6 rupee worth of per capita consumption. When impacts of credit are estimated by operational landholding, it seems that the distribution of benefits vary by the size of operational holding. In particular, the returns to consumption for borrowing from ADBP are as much as 13 percent for small holders holding up to 2.5 acres of land compared to a small and insignificant rate of 1-2 percent for medium and large farmers.

Is farm credit cost-effective for the ADBP to lend? Using some estimates of the net cost that is not recovered from its income, we find that the ADBP is subsidized, even more subsidized than the Grameen Bank of Bangladesh, a highly donor dependent and poor-focused micro-credit program.[21] Using the subsidy of ADBP as the cost of delivering formal credit to rural households, estimates show that the government of Pakistan has to provide a subsidy of as much as 8 percent of its loan outstanding each year for supporting the ADBP operation; otherwise the ADBP cannot run its business. Reduction of subsidies must be done through cost savings such as reducing loan default costs and by raising nominal interest rate that at least reflects a positive real on-lending rate. It must also practice self-reliance by relying more on its mobilized deposits and savings rather than government and donor resources for on-lending.

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[21] For a case study on Bangladesh's Grameen Bank, see Khandker (1998).

More importantly, it is necessary to relax stringent collateral requirements and extend the outreach so that formal lenders, such as ADBP, can reach the poor and the asset-less. Results suggest that institutional credit is productive, and that its outreach is limited to a small proportion of the population that does not perhaps need subsidized credit. Its outreach should be expanded and collateral requirements relaxed so that credit has its desired impact, while steps to cut down default rates should be taken at the same time. There is little doubt that credit channeled in the right direction can have significant anti-poverty effects, and that broadening the outreach of formal lending institutions can be a step forward in the right direction.

Table 1: Provincial Distribution of Households by Loan Categories

Province	Borrowing households	Non-borrowing households	Households borrowing from formal sources only	Households borrowing from informal sources only	Household borrowing from both formal and informal sources
NWFP	295	128	7	270	18
Punjab	1,325	1,072	42	1,245	38
Sindh	697	273	24	649	24
Balochistan	201	157	13	180	8
AJ&K	63	169	3	57	3
Total	2,581	1,799	89	2,401	91

Table 2: Distribution of loans by sources

Formal sources	Percentage	Informal sources	Percentage
Government	4.8	Friend/relative	57.2
ADBP	86.5	Commercial agent	4.9
Commercial Bank	3.2	*Arthi*	6.0
Cooperative	1.8	Input supplier	5.9
NGO	3.7	Shopkeeper	7.0
		Landlord	12.8
		Employer	1.9
		BISI and others	4.3
Total amount of formal loans (million rupees)	10.90	Total amount of informal loans (million rupees)	38.85

Table 3: Distribution of different loans by purpose and duration (percent)

	Purpose of borrowing			Terms of borrowing		
	Personal	**Agricultural**	**Non-agricultural**	**Short**	**Medium**	**Long**
Number of formal loans	16.3	73.8	9.9	22.5	22.6	54.9
Number of informal loans	79.2	14.6	6.2	66.6	27.5	5.8
Number of all loans	77.3	16.4	6.3	65.3	27.4	7.3
Amount of formal loans	5.2	87.5	7.3	8.1	15.2	76.7
Amount of informal loans	55.5	26.9	17.7	35.3	42.2	22.5
Amount of all loans	44.5	40.1	15.4	29.4	36.3	34.4

Note: 1. Personal purposes are unproductive like consumption, marriage or death in the family, etc. Agricultural purposes include purchase of land, machinery, production materials, etc. Non-agricultural purposes include investment in non-farm assets.
2. Short term loans are for up to 6 months, medium term loans are for more than 6 months and up to 1 year, and long term loans are for more than 1 year.

Table 4: Distribution of borrower households by operational holding

	Borrower household category by operational holding				
	Landless	Subsistence	Small	Medium	Large
All households	34.2	35.2	18.3	8.2	4.1
Households borrowing exclusively from formal sources	5.2	17.6	21.3	14.3	41.6
Households borrowing exclusively from informal sources	24.6	30.8	19.9	15.3	9.4
Households borrowing from both Formal and informal sources	20.4	27.9	20.2	15.1	16.4

Note: 1. Operational landholding = Land owned + Land rented + Land sharecropped-in – Land rented out – Land left uncultivated.
2. Household category by operational holding has been defined as: Landless (no land), subsistence (0 acre>land<=5 acres), small (5 acres> land<=12.5 acres), medium (12.5 acres > land<=25 acres), and large (land>25 acres).

Table 5: Weighted Means and Standard Deviations of dependent variables and selected independent variables

Variables	Mean	Standard Deviation
Total formal loans of household (rupees)	1,981	18,765
Annual consumption of household (rupees)	27,060	18,241
Cost of annual crop production of household (rupees)	5,085	13,626
Value of net annual production of household (rupees)	16,377	39,479
Total investment of household (rupees)	5,099	19,531
Total non-land assets of household (rupees)	69,946	136,347
Labor of household males (hours/month)	223.8	188.4
Labor of household females (hours/month)	79.2	120.7
Highest grade completed by a male in household	5.73	4.71
Highest grade completed by a female in household	2.14	2.95
Land owned by household (acre)	14.04	87.79
Number of observations	4,380	

Table 6: First stage tobit estimates ADBP borrowing

Explanatory variables	Coefficient
Max. male education in household (years)	1.331 (5.755)
Max. female education in household (years)	0.320 (1.097)
Land owned by household (acre)	0.029 (2.639)
Price of rice (Rs. Per kg)	-0.285 (-1.098)
Price of wheat (Rs. Per kg)	-0.570 (-1.095)
Price of gram/pulses (Rs. Per kg)	0.103 (0.590)
Price of milk and milk products (Rs. Per kg)	-0.748 (-1.695)
Price of vegetable oil (Rs. Per kg)	-0.247 (-1.582)
Price of beef (Rs. Per kg)	0.173 (1.906)
Price of fish (Rs. Per kg)	-0.005 (-0.071)

Table 6: First stage tobit estimates ADBP borrowing (continued)

Explanatory variables	Coefficient
Price of vegetables (Rs. Per kg)	0.093 (0.365)
Price of brown sugar (Rs. Per kg)	0.421 (1.828)
Price of fruits (Rs. Per kg)	-0.368 (-2.802)
Price of maize (Rs. Per kg)	0.138 (3.346)
Price of other grains and cereals (Rs. Per kg)	-0.010 (-0.307)
Mean of max. male education for other households of this community (years)	0.077 (0.046)
Mean of max. female education for other households of this community (years)	-4.268 (-2.630)
Mean of log of landholding for other households of this community	-8.617 (-1.421)
Mean of max. male education for all households of this community (years)	-0.118 (-0.060)
Mean of max. female education for all households of this community (years)	4.191 (2.948)
Mean of log of landholding for all households of this community	10.825 (1.596)
Mean of max. male education for all households in other communities of this district (years)	0.423 (0.413)
Mean of max. female education for all households in other communities of this district (years)	0.142 (0.087)
Mean of log of landholding for all households in other communities of this district	-2.144 (-0.751)
Mean of max. male education for all households in this district (years)	-0.833 (-0.564)
Mean of max. female education for all households in this district (years)	-0.118 (-0.055)
Mean of log of landholding for all households in this district	2.873 (0.551)
Mean of max. male education for all households in other districts (years)	3.033 (1.683)
Mean of max. female education for all households in other districts (years)	-3.220 (-1.727)
Mean of log of landholding for all households in other districts	-3.603 (-0.676)
Constant	-39.286 (-2.336)
Likelihood ratio (Chi squared 30)	211.70
Adjusted R squared	0.084
Number of observations	4,380

Table 7: Impacts of ADBP borrowing

Household outcomes Log of	**OLS Model**	**2-stage model[1]**
Household annual consumption (rupees)	0.007 (2.261)	0.004 (2.378)
Household annual crop production cost (rupees)	0.102 (3.388)	0.110 (6.855)
Household annual net production output (rupees)	0.072 (2.542)	0.083 (2.480)
Household non-land assets (rupees)	0.043 (3.193)	0.005 (0.667)
Household male labor supply (hours/month)	0.012 (0.860)	0.004 (0.593)
Household female labor supply (hours/month)	0.064 (2.110)	0.098 (6.158)

[1]The first stage of 2-stage model consists of a tobit regression with amount of formal lending as dependent variables. t-statistics of the second stage have been corrected.

Notes: t-statistics in parentheses.

All variables reported here are in logarithmic form.

Regressions also included following explanatory variables: highest grade attained by any male and that by any female, number of adult males and that of adult females, age of household head (years) and log of household's land asset.

Table 8: Durbin-Wu-Hausman test to determine whether 2-stage model is more appropriate (Ho: difference in coefficients is not systematic)

Household outcome	F (1, 4359)	p>F
Household annual consumption (rupees)	4.04	0.04
Household annual crop production cost (rupees)	45.86	0.00
Household annual net production output (rupees)	52.47	0.00
Household non-land assets (rupees)	0.00	0.99
Household male labor supply (hours/month)	0.50	0.48
Household female labor supply (hours/month)	41.23	0.00

Note: The Durbin-Wu-Hausman test simply tests the residual value that is predicted in the first stage regression and included in the second stage regression.

Table 9: Marginal return to ADBP borrowing (percent)

Household outcomes	OLS Model	2-stage tobit model
Household annual consumption (rupees)	9.56*	5.46*
Household annual crop production cost (rupees)	26.18*	28.23*
Household annual net production output (rupees)	59.52*	68.61*
Household non-land assets (rupees)	151.83*	17.65
Household male labor supply (hours/month)	0.001	0.001
Household female labor supply (hours/month)	0.003*	0.004*

* t-statistics are 10% or better.

Table 10: Costs of lending for ADBP

Cost component	1991	1992	1993	1994	1995
Funds borrowed at concessional rate (A) (million rupees)	32,376.88	35,952.24	42,309.78	43,880.11	48,003.75
36-month interest rate (m) (percent)	10.5	11.99	11.57	11.71	11.77
Concessional rate (c) (percent)	6.21	6.70	5.71	6.20	6.04
Interest subsidy (IS= A*(m-c)) (million rupees)	1,388.97	1,901.87	2,479.35	2,417.79	2,750.61
Annual equity (E) (million rupees)	3,910.7	5,279.15	6,113.40	6,306.01	6,428.65
Equity subsidy (ES=E*m) (million rupees)	410.63	632.97	707.32	738.43	756.65
Reported annual profit (P) (million rupees)	114.85	152.41	189.25	192.61	195.30
Net subsidy (NS=IS+ES-P) (million rupees)	1,684.75	2,382.43	2,997.42	2,963.61	3,311.96
Annual average outstanding loan portfolio (LP) (million rupees)	35,582.17	37,312.35	38,791.60	40,215.77	44,160.31
Subsidy as a percentage of loan portfolio	4.73	6.39	7.73	7.37	7.50
On-lending interest rate (i) (percent)	12.5	12.5	13.5	13.5	13.5
Inflation rate (percent)	9.6	10.0	13.9	13.6	10.4
SDI (NS/LP*i)	0.38	0.51	0.57	0.55	0.56
Required interest rate based on SDI (percent)	17.2	18.9	21.2	20.9	21.0

Source: PIDE (1998)

Table 11: Recovery rates for ADBP loans

	1991	1992	1993	1994	1995	1996
Recovery rate of current dues	69.15	66.47	51.40	57.42	69.17	56.05
Recovery rate of all dues	59.29	54.77	62.35	53.85	52.30	44.68

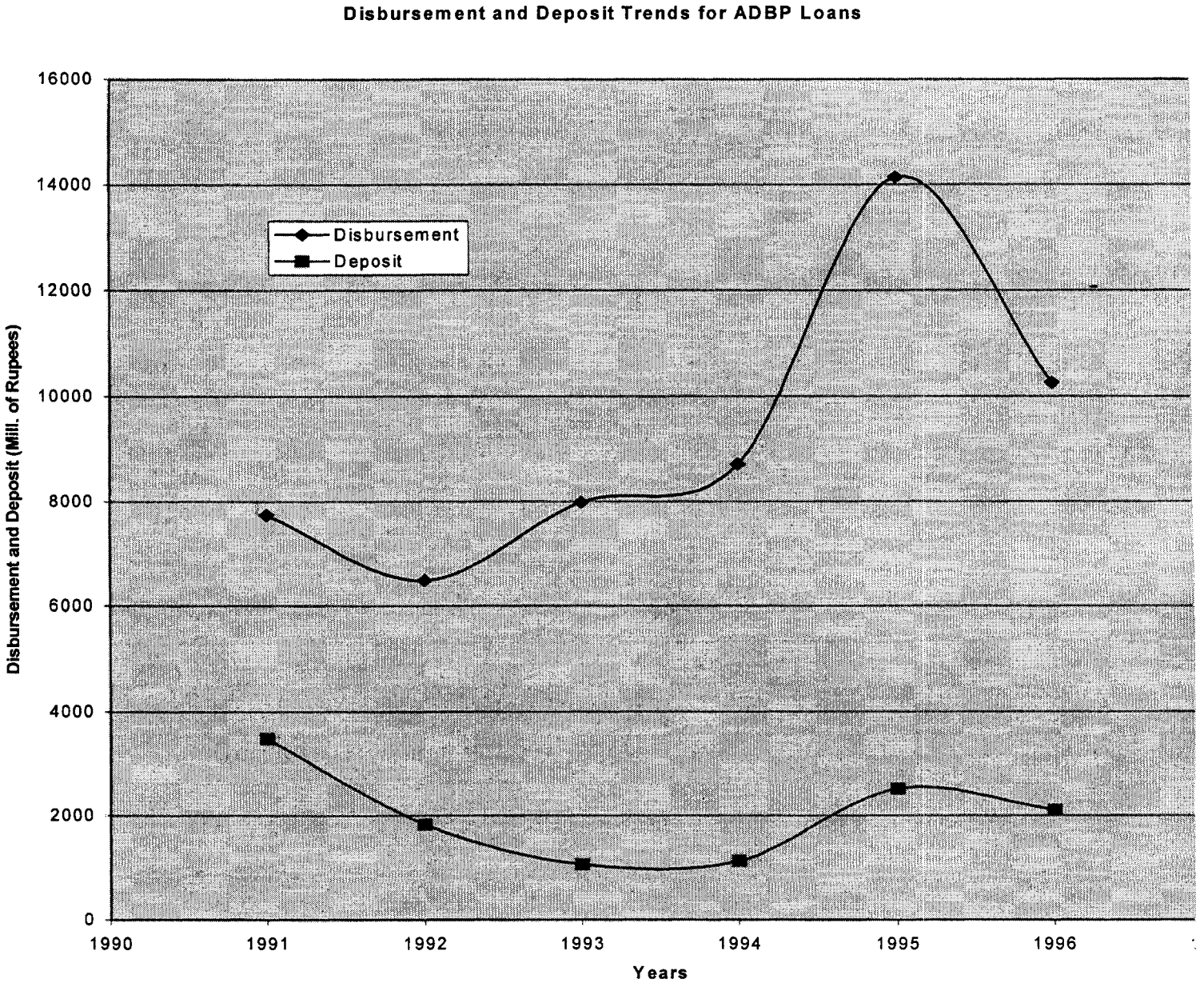
Source: PIDE (1998)

Table 12: Cost-effectiveness of ADBP lending based on actual distribution of loans

ADBP annual loan out-standing (mill. Rs)	Borrower type	Share of loans	Amount received (mill. Rs)	Merginal return	Gains accrued (mill. Rs)	Benefit (Total of gains accrued) (mill. Rs)	Cost (annual subsidy) (mill. Rs)	Cost-benefit ratio
44,160.3	Small	0.420 (1.00)	18,547.2 (44,160.3)	0.130*	2,411.1 (5,740.8)	2,457.7 (5,740.8)	3,311.7	1.347 (0.577)
	Medium	0.412 (0)	18,194.0 (0)	0.001	18.2 (0)			
	Large	0.168 (0)	14,189.3 (0)	0.002	28.4 (0)			
	Aggregate	1.00	44,160.3	0.055*	2,488.8	2,488.8	3,311.7	1.331

*Estimates are significant at 5% level

Note: Figures in parentheses are based on the assumption that total lending is disbursed only to borrowers with positive and significant returns (that is, small holders in this case).


Disbursement and Deposit Trends for ADBP Loans
16000
14000
12000
10000
8000
6000
4000
2000
0
Disbursement and Deposit (Mill. of Rupees)
Disbursement
Deposit
1990
1991
1992
1993
1994
1995
1996
Years

Appendix: Rural Financial Market Studies (RFMS) survey data description

The paper uses data from the Rural Financial Market Study (RFMS), conducted for the State Bank of Pakistan with financial assistance from the World Bank in 1996. Household survey and informal lenders' survey data were collected by two organizations – the Applied Economic Research Center (AERC) of the University of Karachi and the Punjab Economic Research Institute (PERI) in Lahore. The Pakistan Institute of Development Economics (PIDE) in Islamabad collected the institutional data on Agricultural Development Bank of Pakistan (ADBP) and commercial banks working in the rural sector. Household survey data was collected for the all five provinces of Pakistan, namely North Western Frontier Province (NWFP), Sindh, Balochistan, Punjab and Pakistan controlled Kashmir (AJ&K). A rural household sample survey was conducted on the pattern of the LSMS surveys conducted by the World Bank to provide the data base. Various aspects of the household economy, including demographic information, labor supply, household expenditure, income sources, farm production, borrowing practices, assets and liabilities were covered.

A two-stage stratified sampling strategy was adopted for selection of villages and households. In the first stage, 250 villages were selected randomly from a total of approximately 50,000 villages in Pakistan (as reported in Agricultural Statistics 1994-5). The allocation of villages within the provinces was done in proportion to cultivated area. A completely randomized sampling strategy was adopted for each provincial sample. Villages were selected randomly from the province after excluding very small and very large villages, depending on the size distribution of villages within each province.

In the second stage, household information from each village was used to sample households on the basis of landholding size and/or occupational distribution. A census of households was conducted in each of the selected 250 villages to gather information on landholding size and occupational distribution. To sample households within a village, a three-stage procedure was adopted. First, the number of households selected from a village was in proportion to the total household counts of villages. Second, the households drawn from a village were distributed in proportion to the distribution of landholding categories. Finally, the number of households to be interviewed were drawn randomly from the total number of households in each category in each village. In all, 6,000 household were covered from the 250 selected villages, for an average of 24 households per village. However, because of data collection errors, we finally managed to use data of 4,380 households of 217 villages in this paper. In order to reflect the actual distribution, we used sampling weights in both the

descriptive and econometric analyses. The provincial distribution of villages and households for the original and reduced sample is shown in table 1.

Appendix table 1: Provincial Distribution of Villages and Households

	Original sample		Revised sample	
Province	**Villages**	**Households**	**Villages**	**Households**
NWFP	22	528	22	423
Punjab	130	3,120	115	2,397
Sindh	67	1,602	52	970
Balochistan	20	486	17	358
AJ&K	11	264	11	232
Total	250	6,000	217	4,380

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